

In re Patent Application of:
STORM ET AL.
Serial No. 10/820,464
Filed: **APRIL 8, 2004**
Confirmation No. 7257

REMARKS

Applicants would like to thank the Examiner for the thorough examination of the present application.

The independent claims have been amended to remove the recitation "with the linear output signal being selected when greater than a predetermined value". The Applicants submit that the independent claims as amended overcome the 35 U.S.C. §112 rejections.

Independent Claims 21 and 31 have further been amended to include the subject matter from their respective dependent Claims 24 and 33, which is directed to the logarithmic output signal being derived based upon reading a near instantaneous illumination-dependent voltage on the photodiode that is a logarithmic function of the illumination. These dependent claims have been cancelled.

The claim amendments and the arguments supporting patentability of the claims are provided below.

I. The Amended Claims

The present invention, as recited in amended independent Claim 14, for example, is directed to an image sensor comprising an array of pixels, each pixel comprising a photodiode, a first output circuit for deriving linear output signal by applying a reset signal to the photodiode and reading a voltage on the photodiode after an integration time, and a second output circuit for deriving logarithmic output signal by reading a near instantaneous illumination-dependent voltage on the photodiode that is a logarithmic function of the illumination. The first and second output circuits sequentially provide the linear and logarithmic output. An output selection circuit is

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coupled to the array of pixels for selecting between the linear output signal and the logarithmic output signal as an output signal.

Independent Claim 21 is directed to an image sensor, and has been amended similar to independent Claim 14.

Independent Claim 31 is directed to a method for operating an image sensor, and has been amended similar to independent Claim 14.

II. The Claims Are Patentable

The Examiner rejected independent Claims 14, 21 and 31 over the article by Tu et al., titled "CMOS Active Pixel Image Sensor With Combined Linear And Logarithmic Mode Operation" in view of the Serizawa et al. patent. The Examiner cited Tu et al. as disclosed the claimed invention except for the first and second output circuits sequentially providing the linear and logarithmic outputs. The Examiner cited Serizawa et al. as disclosing this feature of the claimed invention.

The Applicants submit that even if the references were selectively combined as suggested by the Examiner, the claimed invention is still not produced. In particular, the Examiner has characterized that the long exposure (i.e., large dynamic range) in Tu et al. is considered to be a logarithmic mode. The Applicants respectfully submit that this statement is incorrect.

A long exposure simply means that a lower illumination level can be captured. The dynamic range does not change if the exposure is changed in a linear system. Tu et al. actually states in the first paragraph of page 756 that the logarithmic mode does not have an integration time: "Owing the logarithmic response, this configuration has a large dynamic range. The absence of an

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integration time allows truly random access to the array."

(emphasis added).

Tu et al. thus discloses that there is no integration time in the logarithmic mode. The absence of an integration time thus corresponds to the logarithmic mode. In the claimed invention, the second output circuit derives a logarithmic output signal by reading a near instantaneous illumination-dependent voltage on the photodiode that is a logarithmic function of the illumination. The near instantaneous illumination-dependent voltage on the photodiode thus corresponds to an absence of an integration time.

In Serizawa et al., short and long exposure times are discussed, where the Examiner characterized the long exposure time as corresponding to the logarithmic mode. As noted above, the logarithmic mode corresponds to absence of an integration time, or the reading of a near instantaneous illumination-dependent voltage as in the claimed invention. The Examiner has fundamentally misinterpreted a "logarithmic mode." Dynamic range is simply not concerned with exposure time, but rather is concerned with the ability to respond to both low light levels and high light levels independent of integration (or exposure) times.

Accordingly, it is submitted that amended independent Claim 14 is patentable over the Tu et al. article in view of the Serizawa et al. patent. Amended independent Claims 21 and 31 are similar to amended independent Claim 14. Therefore, it is submitted that these claims are also patentable over the Tu et al. article in view of the Serizawa et al. patent.

In view of the patentability of amended independent Claims 14, 21 and 31, it is submitted that the dependent claims,

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which include yet further distinguishing features of the invention are also patentable. These dependent claims need no further discussion herein.

III. CONCLUSION

In view of the amendments to the claims and the arguments provided herein, it is submitted that all the claims are patentable. Accordingly, a Notice of Allowance is requested in due course. Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,



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